An integrated model for encouraging consumer EV purchase: UTAUT extended with electric vehicle knowledge and advertisement

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Highlights

- Consumer-limited knowledge leads to limited adoption of EVs.
- Advertisement can strategically position businesses to meet EV market needs.
- Electric Vehicle (EV) knowledge and advertisement encourage consumers to purchase sustainable technology vehicles. It can be a primary source of boosting consumers.
- The Unified Theory of Acceptance and Use of Technology has been extended with EV knowledge and advertisement to encourage consumer motivation.
- Electric vehicles (EVs) have emerged as a transformational technology with the potential to significantly contribute to the achievement of the Sustainable Development Goals (SDGs), specifically Goal 13—Climate Action.

Abstract: Transport sector is acute in improving quality of life, yet its adverse influence on human well-being, societies, and our planet remains through carbon dioxide emissions. Electric Vehicles (EVs) have emerged as a viable way to reduce transportation-related air pollution, although their market penetration remains notably low, especially in developing nations. This study addresses the primary impediment to widespread EV adoption—consumers' lack of awareness, motivation, and knowledge regarding EV features. Employing the UTAUT (*Unified theory of acceptance and use of technology*) paradigm, amplified with an innovative augmentation incorporating advertisement strategies, this study pioneers a holistic assessment of consumer inspiration and EV knowledge. Employing Partial Least Squares Structural Equation Modelling (PLS-SEM), we assessed the impact of five factors, "performance expectancy, effort expectancy, social influence, EV knowledge, and advertisement on the intention to purchase" electric cars using data collected via convenience sampling from 278 respondents in Malaysia. The study unveiled inadequate consumer ecological awareness and EV knowledge. Notably, the results presented a substantial relationship between advertisement, EV knowledge, and purchase intention. These outcomes underscore the significant role of advertisement in addressing consumer awareness gaps and strategically positioning businesses to meet market needs and attain sustainable development goals _Climate Action. This study provides valuable insights into business strategies for enhancing EV purchase intention, thereby contributing to reducing transport emissions and fostering sustainability.

Keywords: EV Knowledge, Motivation, Advertisement Strategies, Business Performance, Purchase Intention, Sustainability.

1. Introduction

The year 2030 heralds a transformative era with the SDGs, capturing the attention of scholars and decision-makers alike for their potential impact on economies, health, and the environment, particularly in the rapidly urbanizing landscape where two-thirds of the global population is projected to reside by 2050 (DESA, 2018). Against a backdrop of escalating global challenges—from overpopulation to climate change, insufficient resources, and deficiencies—the imperative for urgent, comprehensive action was underscored by the UN Secretary-General in 2019 (UN, 2020). The pursuit of these SDGs, crucial for global well-being and health, especially in the face of eco-friendly well-being menaces like climate change (Goal 13), pivots significantly on the state of transportation infrastructure (Abbasi, 2021; Salmond *et al.*, 2018; Vardoulakis *et al.*, 2019).

The efficacy of transportation infrastructure is not only pivotal for national progress but also a linchpin for the prosperity of cities and their inhabitants, constituting a reliable revenue source critical to the growth of nations around the world. A well-coordinated transportation network not only fosters economic growth but also bolsters environmental sustainability (Bartle *et al.*, 2019), necessitating a paradigm shift in consumer preferences towards sustainable transportation. The current reliance on petroleum fuels by the transportation industry, particularly through Internal Combustion Engine (ICE) vehicles, underscores the need for a transition towards eco-friendly alternatives, as ICE vehicles contribute to air pollution through emissions of various gases (Vardoulakis *et al.*, 2019).

Globally, policymakers are directing their attention toward steering consumers toward sustainable transportation (Qureshi *et al.*, 2007), placing particular emphasis on the acknowledgment of Electric Vehicles (EVs). The promotion of EVs as the prime means of environmentally friendly transportation aligns with global environmental goals. Within this context, Malaysia, ranking as the 25th major producer of greenhouse gases (GHGs), grapples with the transportation sector emerging as the second-largest contributor to carbon emissions after industry (Star, 2019). Notably, Malaysia boasts the third-highest ownership rate of ICE cars globally, standing at an overwhelming 93% (Malaysiakini, 2014).

In Malaysia, the country's rapid suburbanization, economic expansion, and rising incomes have contributed to a significant increase in car ownership, which has been accompanied by rising air pollutants and environmental risks from emissions of greenhouse gases. Committed to addressing these challenges, Malaysia has outlined ambitious targets for 2030 to reduce GHG emissions in the GreenTech Master Plan (Emon *et al.*, 2025; Mardhiah, 2024). Of particular concern is the transport sector, identified as the second-key source of GHG emissions. The deployment of sustainable automobiles solely, however, is inadequate in the absence of simultaneous consumer endorsement and acceptance. The recognition of advanced technologies, especially in emerging nations like Malaysia, necessitates monetary and educational support,

intertwined with consumer acknowledgment (Choo *et al.*, 2024; Karp, 2016). The production of EVs by automakers is only one part of the equation; the success hinges on effective promotional strategies as EVs, despite their environmental benefits, struggle to gain a substantial market share.

In Malaysia, the smooth adoption of EVs encounters significant obstacles, and both the supply and demand sides of the market must converge to facilitate increased EV purchases. Effective selling strategies by automakers can invigorate consumer intent to improve business performance, and governmental support is crucial in the form of subsidies to offset high capital costs associated with charge infrastructure production (Star, 2019). Public interest and motivation, as highlighted in recent studies (Abbasi, Johl*, et al.*, 2021; Abbasi, Shaari*, et al.*, 2021), play a pivotal role in bolstering demand for EVs. However, despite the existing supply of EVs in the Malaysian market, the absence of robust marketing efforts contributes to low sales. While several paradigms and theories have been employed to elucidate consumer motivations for EV adoption, our study contributes by examining the unique interplay among the UTAUT and advertisement, alongside EV environmental knowledge. Our exploration aims to present a thorough understanding of customer motivation for EVs, offering insights that can inform strategies and approaches to accelerate the evolution towards sustainable transportation.

UTAUT offers an effective framework for comprehending the adoption of technology; nevertheless, because EV making choices are multifaceted and complicated, its relevance to EV adoption necessitates contextual adaptation (Venkatesh et al., 2003; Oliveira et al., 2021). Based on both empirical data and theoretical justification, two more constructs—EV knowledge and advertisement—have been incorporated into UTAUT to increase the ability to explain in the context of EVs. Customers' perceptions of EV technology's utility and usability, as well as its operating requirements, cost savings, and environmental advantages, have a big impact on their intents to embrace it (Rezvani et al., 2015; Wang et al., 2021; Kapser & Abdelrahman, 2020). Knowledge gap and disinformation continue to be significant obstacles to EV adoption, according to research, especially in developing nations (Rezvani et al., 2015). Ads have also been theoretically connected to facilitating circumstances and social impact. A vital source of information that lowers uncertainty and boosts confidence in emerging technology, advertising also influences social norms and public opinion (Chen et al., 2022; Hossain et al., 2023). In markets with little knowledge and significant resistance to change, adoption of EVs must be fueled by innovative marketing that establishes social desirability and perceived behavioral control (Moons & Pelsmacker, 2015; Nayum et al., 2016). The updated model overcomes the shortcomings of earlier studies that employed UTAUT without considering the knowledge and promotional context of EV uptake by incorporating these constructs. The improved literature review now offers a methodical, theory-based defense of model extensions and lays out a clear course for achieving the study's goals, improving conceptual clarity and applicability. In response to this research gap, this study intends to examine the advertising role and EV knowledge in shaping consumer decisions to

purchase EVs. By focusing on the aspects that encourage and heighten customer awareness of EV features, we extend the UTAUT model by incorporating advertising and EV awareness.

The current study investigation endeavors to unearth the facets that can boost consumer interest in purchasing EVs. Recognizing the gap in existing literature, we delve into the elements influencing consumer intentions to acquire EVs, with an emphasis on the role of advertising strategies. This research is particularly pertinent in the Malaysian context, where actual EV purchases do not align with declared preferences of consumers (Coffman *et al.*, 2017). In our pursuit, we propose to shed light on the intricacies of consumer motivations, paving the way for more effective advertising strategies and targeted interventions that align with the SDGs, specifically Goal 13—Climate Action. The Malaysian government, cognizant of the need for a carbon-free environment, has set ambitious targets to reduce GHG emissions by promoting the acceptance of EVs. However, the success of this endeavor hinges not only on the availability of sustainable vehicles but also on consumer acceptance and intent to purchase. The concept of "UTAUT," while providing a valuable framework for understanding consumer technology adoption, falls short in capturing the nuanced dynamics of the EV marketplace, particularly in the Malaysian context. This investigation seeks to bridge the gap between theoretical models and practical consumer behavior, focusing on the unique EV dynamics in the Malaysian market. By exploring the impact of advertising and EV knowledge within the framework of UTAUT, we aim to contribute valuable insights that can inform strategies to enhance EV purchase intention, address market challenges, and align with the broader global agenda of sustainable development. In the undermentioned sections, we delve into a detailed literature review, hypotheses development, methodology, results, and implications of our study, offering an inclusive assessment of the factors inducing consumer decisions in the evolving landscape of EV adoption.

2. Unified Theory of Acceptance and Use of Technology

The concept "UTAUT" has been widely used to characterize how quickly consumers accept new technology. Despite its widespread use, emerging technology developers still grapple with the challenge of translating consumer acceptance into increased market share (Almetere *et al.*, 2020). Within the realm of motivation research, various models, including the "user choice model, time-series model, cohort estimate model," for automobile endurance (Higuchi *et al.*, 2012). UTAUT has sought to elucidate the complex interplay of factors influencing consumer purchasing behavior (Abbasi, Johl, *et al.*, 2021). Sang *et al.* (2015) assert that businesses' social, demographic, ecological, fiscal, performance, infrastructural eagerness, and administrative interference are more significant in influencing customer purchasing behavior.

Venkatesh *et al.* (2003) conducted an empirical analysis aiming to amalgamate components from eight behavior intention paradigms utilized in technology acceptance-related studies. This endeavor ensued in the formation of the UTAUT, a model that encapsulates approximately 70% variance in intent. The amalgamated models include the "Theory of Reasoned Action (TRA), Technology Acceptance Model

(TAM), Theory of Planned Behavior (TPB), combined TAM and TPB, Model of PC Utilization (MPCU), Motivation Model (MM), Social Cognitive Theory (SCT), and Innovation Diffusion Theory (IDT)". The UTAUT model has been widely used to investigate technology adoption, dissemination, and innovation diffusion in a variety of fields, including IT, psychological research, management, and marketing. This model holds a pivotal role in characterizing the dispersion of advanced technology vehicles among consumers.

UTAUT framework offers a theoretical paradigm for examining customer acceptance of avant-garde technology-driven products or services. Grounded in four elements—"performance expectations, effort expectations, social influence, and facilitating conditions"—the model elucidates consumers' adoption intentions (Venkatesh *et al.*, 2003). However, outcomes reveal that not every factor of the UTAUT model is equally critical for assessing consumer acceptance of new products or services. Notably, research suggests that the variables significantly predicting customers' intent to use innovative technology, or mobile-based products, are primarily "performance expectancy and effort expectancy" (Alraja *et al.*, 2016; Darras Barquissau *et al.*, 2024; Moughal *et al.*, 2023b; Ryu *et al.*, 2021).

In this review, we emphasize three elements from the "UTAUT model—performance expectancy, effort expectancy, and social influence"—to comprehend why consumers are drawn to sustainable automobiles. The literature encompasses various factors influencing consumer behavior, including "effort expectancy, performance expectancy, incentives, social influence, facilitating conditions, environmental concern, perceived enjoyment, price, and charging infrastructure". This research, however, concentrates on motivational factors related to encouragement, such as customization, advancement, and perceived enjoyment, which T.L. Childers (2001) identified as intrinsic motivational elements capable of enhancing customer behavioral intention. Additionally, we explore variables not traditionally considered motivational factors within the UTAUT framework that may impact customer interest in and knowledge about electric vehicles.

Our study specifically investigates the motivational factors of "performance expectancy, effort expectancy, social influence, EV knowledge, and advertisement" from the perspective of EV adoption. This nuanced approach aims to improve knowledge of consumer motivations in the pursuit of sustainable transportation.

2.1 Performance Expectancy (PE)

Performance Expectancy (PE) emanates from the notions of perceived usefulness described in the "Theory of Reasoned Action TRA and Technology Acceptance Model TAM". It distinctly gauges the degree to which individuals perceive that utilizing a specific practice will boost their experience with modern technology across various contexts (Kaye *et al.*, 2020; Venkatesh *et al.*, 2003). Drawing a parallel, students'

perspectives on utilizing mobile learning to augment their academic performance are encapsulated within the domain of PE. Venkatesh *et al.* (2003) revealed that PE stands out as a potent element of consumers' behavioral intentions when engaging with technology.

Extensive literature underscores the pivotal role of PE in technology acceptance. In the present research context, it pertains to the purchasing behavior of electric vehicles (EVs). Venkatesh *et al.* (2003) ascertain that PE emerges as the most robust predictor of a consumer's intention to embrace a technology, particularly in the realm of EVs where superior performance compared to standard automobiles is a key consideration. The influence of PE extends beyond EVs, impacting client perceptions of cloud technology as highlighted by (Ali *et al.*, 2019; Moughal *et al.*, 2023d). Various studies accentuate PE's significance in the procurement of modern technology goods and its position in driving the acceptance of advanced technologies (Ali *et al.*, 2019; Tran *et al.*, 2019). Notably, Tran *et al.* (2019) observe a positive impact of PE on customer intentions from the perspective of EV sharing in China. Building on these insights from the literature, this study posits the hypothesis:

Hypothesis 1: PE will significantly influence user EV purchase intention.

2.2 Effort Expectancy (EE)

Effort Expectancy (EE) encapsulates a user's insight into well-being and comfort when engaging with advanced technology, signifying the extent of convenience allied with its usage (Venkatesh *et al.*, 2003; Zolfagharian *et al.*, 2021). Positioned as a key indicator in UTAUT, EE performs a crucial position in gauging the likelihood of technology acceptance. Extensive literature attests to the value of EE in predicting customer intentions, particularly in the realm of emerging technologies (Chen *et al.*, 2020; Madigan *et al.*, 2016; Tran *et al.*, 2019). Madigan *et al.* (2016) specifically showcase the impact of EE on consumer acceptance of sustainable transportation systems in European regions.

In the context of this research, "EE" is hypothesized as a consumer's assessment of the simplicity combined with using sustainable electric vehicles (EVs). The premise is that EVs, with their contemporary technology, should offer a hassle-free and user-friendly experience. The literature strongly suggests that EE not only influences consumers' intentions to use a particular technology but also shapes their actual usage patterns (Arman *et al.*, 2015; Moughal *et al.*, 2023b). The notion here is that if consumers perceive EVs as easy to operate, their interest and intention to purchase these vehicles are likely to surge.

Evidence from studies by Khalilzadeh *et al.* (2017); Šumak *et al.* (2017) emphasizes the direct effect of both PE and EE on behavioral intention. This underscores the interconnectedness of these factors in shaping consumer decisions. Therefore, drawing from these insights, this posits the subsequent hypothesis:

Hypothesis 2: EE will significantly affect user EV purchase intention.

2.3 Social Influence (SI)

Social Influence (SI) delineates the extent to which a user identifies the significance of others' opinions in the framework of accepting innovative technology (Kaye *et al.*, 2020; Venkatesh *et al.*, 2003). This construct emerges as a pivotal element influencing Malaysian customers' intentions to purchase Electric Vehicles (EVs), as highlighted by (Sang *et al.*, 2015). The impact of SI on behavioral intention finds support not only in Malaysia but also in the European context, particularly in the domain of road transportation adoption (Madigan *et al.*, 2016).

However, the literature reveals a nuanced landscape where the influence of SI on customer intentions varies across different geographic locations. While studies affirm the positive impact of SI in Malaysia and Europe, research in China and Germany suggests that SI might not exert a favorable influence on customer intentions regarding EV adoption (Tran *et al.*, 2019; Wahl *et al.*, 2020). This geographical variance accentuates the contextual nature of SI's influence on user behavior. The interplay of cultural, social, and economic factors across regions contributes to the divergent effects of social influence. In light of these insights, this posits the hypothesis:

Hypothesis 3: SI significantly influences consumer intentions towards an EV purchase.

2.4 Electric Vehicle Knowledge (EVK)

Consumer education about EVs is crucial to advancing EV development (Burgess *et al.*, 2013; Degirmenci *et al.*, 2017). Electric Vehicle Knowledge (EVK) encapsulates an individual's understanding of the ecosystem, the natural world, and the effect of individual behavior on nature (Arcury *et al.*, 1987). Customers who are informed about environmental issues and potential solutions tend to be more environmentally conscious (Safari *et al.*, 2018). Adu-Gyamfi *et al.* (2022) also suggested that consumers' perceptions of the effectiveness of ecological products can be improved by their knowledge of the environmental benefits. Consumers are becoming increasingly concerned about preferring items based on their knowledge and expertise (Rizwan *et al.*, 2014). EV environment-related knowledge considerably enhances consumer interest in eco-friendly EVs; hence, improved EV knowledge enhances consumer consumption patterns. Green marketing methods must be used by government organizations and enterprises to increase customer acceptance of ecologically friendly products (Omar *et al.*, 2017).

Consumers' ecological knowledge and awareness can be influenced by effective marketing methods, and they can be encouraged to change their lifestyle to include more eco-friendly transportation. Information as well as knowledge about a specific item confirm the customer's view of the item's diversity (Abbasi, Johl*, et al.*, 2021; Abbasi, 2021; Murray *et al.*, 1990). As a result, EV environmental knowledge can be a dominant motivator for consumers (Boo *et al.*, 2013; Degirmenci *et al.*, 2017). Consumers' EV knowledge, awareness, and care favorably affect consumer behavior. Recognizing the potential of EV environmental awareness as a powerful motivator for consumer behavior, this study formulates the hypothesis:

Hypothesis 4: EV knowledge significantly influences consumer EV purchase intention.

2.5 Advertisement (ADV)

Advertising, the art of making a product known to the public, has evolved into a powerful force, especially with the advent of social-media forums (Petkou, 2019). Preconceptions and an absence of EV information have pushed consumers' perceptions of innovative technology out of reach. Social media can aid consumers in making smarter purchases because consumer awareness of EVs is extremely limited. Customers are more conscious about engaging in diverse social media podiums like Facebook, WhatsApp, Twitter, etc. these days (Alalwan, 2018; Chu *et al.*, 2018). To share information and engage in social, political, business-related; and commercial interactions around the products or services, individuals can use social media sites (Moughal *et al.*, 2023c; Rathore *et al.*, 2016). Consumer knowledge of electric vehicles may increase, and they may be persuaded to purchase them via integrated EV advertisement strategies on these platforms. Human behavior and attitudes about business performance, society, and other topics can be affected by advertisements. Social media improves marketing efforts and is a popular global platform for advertising (Moughal *et al.*, 2023a; Moughal *et al.*, 2023b). It is possible to say that advertisement strategies changed the attitudes of consumers toward certain goods, this study formulates the hypothesis:

Hypothesis 5: Advertisement will significantly influence consumer EV purchase intention.

The theoretical framework, as exemplified in Fig. 1, outlines the interplay linking independent variables "performance expectancy, effort expectancy, social influence, EV knowledge, and advertisement" and their collective effect on purchase intention. This paradigm serves as the foundation for the empirical investigation, shedding light on the intricate dynamics influencing consumer decisions in the realm of EV adoption.

Summary of the Literature

Tab 1. Overview of Prior Recent Studies related to EV adoption.

Title	Authors and Year	*Variables and Factors*	Results of the study
Consumers' preferences for electric vehicles: The role of status and reputation	(Buhmann *et al.*, 2023)	*Consumers' variables & behavior, Better infrastructure, government support, consumption of EVs, range of EVs, experience, price of car, information available*	The study focuses on consumer behavior in order to address topics related to sustainability and environmentalism. This finding supports the theory that consumers may be less able to indicate their income and purchasing power by using less expensive sustainable items, and that higher-priced greener products are consequently the only ones that are desired. The study's outcome may indicate that consumers are generally less concerned with environmental issues and more focused on their status and social acceptance.
Consumer Adoption of Electric Vehicles: A Systematic Literature Review	(Bryła *et al.*, 2023)	*2015–2022-year EV adoption-related studies* *The review attempts to provide a thorough summary of the methodology, theories, and variables employed in 57 peer-reviewed studies.*	Governments should provide incentives such as tax breaks, easy access to charging stations, and exemptions from road tolls to foster consumer confidence in the widespread use of electric vehicles (EVs) [21]. Raising public awareness of the EV market is crucial, whether it be through appropriate infrastructure design or the provision of charging stations. Future EV decisions will be heavily influenced by the acceptance of new

			technologies, and the main obstacles to EV adoption will be consumers' skepticism about EV performance, safety regulations, and range on just one charge.
Factors affecting consumers' preferences for electric vehicle: A Korean case	(Jung *et al.*, 2021)	*"attitude toward environmental issues, Vehicle pollution sensitivity', Everyday Life pollution sensitivity, attitude toward vehicle attributes, Vehicle usability, Future-orientation, Vehicle esthetics"*	Consumers who prefer EVs are concerned about environmental degradation, particularly car emissions, and place a significant emphasis on the long-term value of vehicles over automobile aesthetics when acquiring their next vehicle. Also essential to widespread EV adoption in Korea are financial factors like cost of ownership and charger incentives, as well as a network of charging stations.
What drives adoption intention of electric vehicles in India? An integrated UTAUT model with environmental concerns, perceived risk and government support	(Jain *et al.*, 2021)	*"Performance expectancy, effort expectancy, social influence, facilitating condition, environmental concern, Perceived risk, Govt support"*	Performance expectations and favorable environmental factors have a positive impact on EV adoption intentions, whereas perceived risk has a negative impact. It must have the federal government's solid support to raise public knowledge of ecological problems in general, encourage the usage of more sustainable goods, and discourage the usage of products that have major adverse effects on the environment.
What determines consumers' acceptance of electric vehicles: A survey in Shanghai, China	(Xingrong Zhao, **2022**)	*"consumers' attitudes toward vehicle performances, government policies, the prevalence of charging facilities, and life attitudes, consumers' acceptability of EVs"*	Customers with a high level of income, a university degree, and a desire to live in an urban area are more likely to purchase an EV, but households that include extended families are less likely to purchase an EV. Customers who have not purchased an electric vehicle (EV) are more anxious about EV efficiency. Peer interactions play a substantial role in both categories of consumers' EV buying decisions, demonstrating how knowledge interchange between peers has a substantial impact on their purchasing choices.
Consumer Motivation by Using Unified Theory of Acceptance and Use of Technology towards Electric Vehicles	(Haider et al, **2021**)	*PE, EE, SI, Technophilia, PEK*	This study suggests that customer motivation can be beneficial in increasing their intentions to acquire EVs. Customer intentions to buy an EV are highly influenced by factors highlighted in the motivational environment. Despite performance expectancy, a substantial association has been identified among "effort expectancy, social influence, technophilia, perceived environmental knowledge", and intent to buy electric automobiles.
The influence of knowledge management on adoption intention of electric vehicles: perspective on technological knowledge	(MinZhou, et al, 2021)	*PE, EE, SI, FC, satisfaction with incentive policies, price value, Habit, Hedonic motivation*	The study offers empirical support for accepting the behavioral theory centered around the psychological assessments of cab drivers and extends it to include electric taxicabs. This will probably lead to new areas of research. Consumer intention to embrace EVs and their perceptions of EVs' effectiveness, convenience of use, and fun factors are all positively and strongly correlated with consumer technological knowledge. The public's comprehension of EVs' innovative technologies is necessary for their adoption. Ultimately, PEU and PU bolster the impact of CTK on customers' intents to purchase electric vehicles.
Public Intentions to Purchase Electric Vehicles in Pakistan	(Lee *et al.*, 2021)	*PE, EE, SI, FC, EC,*	Audience intentions of utilizing electric vehicles (EVs) in the coming years are positively impacted by perceived ease of usage, environmental issues, and effort anticipation. Nonetheless, the current study obtained no evidence of a substantial relationship among social impact and enabling conditions and EV adoption. The results imply that EV producers hoping to hasten the widespread acceptance of EVs should create marketing plans to spread knowledge about the

			ecological benefits of EVs and improve understanding of EV utilization and efficiency.
User acceptance of electric car-sharing services: The case of the Netherlands	(Riccardo Curtale, **2021**)	*PE, EE, SI, Anxiety free experience, personal attitude, Trust*	The research uncovers the psychological mechanism behind the intention to utilize ECS and offers empirical support for a theoretical framework based on an expanded UTAUT. Discover that the most significant predictor of purpose to employ the ECS is SI, which is subsequently followed by PE, perspective, and anxiety-free attitude. Anxiety-free attitude also acts as a mediator between effort expectancy and faith. The outcomes enable the development of appropriate regulations and marketing initiatives to boost ECS usage.
Moderating effects of personal innovativeness and driving experience on factors influencing adoption of BEVs in Malaysia: An integrated SEM–BSEM approach	(HamedKhazaei **2021**)	*SI, FC, PEN, Range anxiety, Personal innovativeness, Driving experience, EC*	This study aims to ascertain the relationships amongst the plan to buy battery-powered cars in Malaysia and the following factors: a sense of enjoyment, ecological concern, societal influence, facilitation condition, and range-related anxiety. An innovative theoretical framework for explaining and forecasting the widespread usage of battery-electric vehicles was put forth in the present study. Positive factors that influence the acceptance of BEVs include perceived enjoyment, FC, EC, SI, and FC. As predicted, range anxiety had a detrimental impact on intention.
Measuring and Modelling Electric Vehicle Adoption of Indian Consumers	(Furqan A. Bhat, **2022**)	*"Environmental enthusiasm, technological enthusiasm, social image, SI, perceived benefits, PE, FC, and anxiety"*	Consumers' intentions to embrace electric vehicles are negatively impacted by favorable conditions and anxiety, while their intentions are positively influenced by environmental issues, technological innovations enthusiasm, societal reputation, societal impact, perceived perks, and performance expectancy. Policy and lawmakers may utilize the study's findings to increase the ratio at which electric vehicles are adopted.
Factors impacting consumers' intention toward adoption of electric vehicles in Malaysia	(Asadi *et al.*, 2021)	*"Perceived value, attitude, perceived behavioral control, subjective norm, awareness of consequences, personal norm, financial incentives, intention to use EV"*	Customers' intentions to acquire electric vehicles were strongly and favorably impacted by their perception of value, behavior, allocation of responsibility, individual standards, personal norms, perceived efficacy, and comprehension of the repercussions. By incorporating NAM as pro-social incentives alongside TPB, which relies mainly on rational decision-making, the system's efficacy and ability to anticipate consumer plans to accept EVs were enhanced.

As revealed in Tab. 1, the adoption of EVs emerged as a significant aspect of reducing the ratio of transport emissions. Since the EV diffusion in early 2010, several studies investigated consumer adoption factors, consumer barriers in the adoption of EVs, charging infrastructure, range anxiety of EVs, advantages of EVs, government support, and the risks that influence the EV adoption market. However, the abovementioned studies have discussed EV significant factors in EV adoption and intention, their focus was not to instigate consumer motivation towards EV purchase. Researchers neglected to focus on boosting consumer EV motivation, rather discussing modeling EV adoption (Bhat *et al.*, 2021), factors impacting consumer intentions (Asadi *et al.*, 2021), personal innovativeness and experience to influence EV adoption (Khazaei *et al.*, 2021), EV car-sharing facilities (Curtale *et al.*, 2021), acceptance & approval of EVs (Xingrong Zhao, 2022), etc. A variety of theoretical approaches extended to examine EV adoption, including theory of planned behavior (Adu-Gyamfi *et al.*, 2022; Wang *et al.*, 2016), TAM (Wang *et al.*, 2018), IDT (Khazaei, 2019), TRA (Marklund *et al.*, 2022) as well as UTAUT (Bhat *et al.*, 2021; Singh *et al.*, 2023). These approaches outspread their model with above mentioned different factors; however, the context of their study

was not focused on encouraging consumers and neglected to use motivational aspects to purchase EVs. This research intended to examine the features that can contribute to consumer inspiration to buy EVs. The present study examined the connection that UTAUT factors "performance expectancy, effort expectancy, and social influence along with EV knowledge and advertisement" among Malaysians to encourage EVs.

UTAUT Model

<Insert Fig 1>

The theoretical model demonstrated in Fig. 1 is established on a review of the scientific literature and depicts both dependent and independent factors, as well as the interactions among variables.

3. RESEARCH METHODOLOGY

3.1. Methodology

3.1.1. Constructs' Measurement

The study aimed to scrutinize the factors influencing purchasing intent, employing a well-structured questionnaire distributed via email. 278 were validated for analysis, ensuring a focused and meaningful dataset. To gauge the constructs' reliability and validity, established scales were utilized. "Performance Expectancy (PE), Effort Expectancy (EE), and Social Influence (SI)" were evaluated utilizing the scales of Venkatesh *et al.* (2003), offering a vigorous foundation for analysis. Advertisement (ADV) was assessed using the scale by Katawetawaraks *et al.* (2011), ensuring consistency in the measurement of this construct. EV Knowledge (EVK) was evaluated through a 4-item scale introduced by (Wang *et al.*, 2018; Zografakis *et al.*, 2010), and (Pagiaslis *et al.*, 2014), ensuring a comprehensive understanding of participants' environmental awareness. Finally, Purchase Intention (PI) was measured based on Ajzen *et al.* (1975); (Dodds, 1991), encompassing the crucial aspect of consumer intent.

To calculate the reliability and consistency of the constructs, Cronbach alpha (CA) was evaluated, with PE exhibiting a value of (0.759), EE at (0.776), SI at (0.770), ADV at (0.887), and EVK at (0.853). These values indicate a maximum-level of internal consistency, ensuring that the measurement items are reliable for assessing the intended constructs. Construct validity was further estimated through the average variance extracted (AVE). While PE exhibited a 0.453, falling below the conventional threshold of 0.5, it is deemed appropriate when the factor composite reliability is ≥0.6, as advocated by (Fornell *et al.*, 1981) (refer to Table 1). This assessment ensures the robustness of the measurement constructs, providing confidence in their ability to capture the intended dimensions accurately.

3.1.2. Data collection

In this analysis, the UTAUT model underwent augmentation, integrating EV knowledge and advertisement to enhance its predictive capacity for consumer desire concerning Electric Vehicles (EVs). The traditional UTAUT model comprises 4 components: "PE, EE, SI, and FC". For this research, facilitating conditions

were omitted, focusing on the three primary components alongside the introduced constructs. The exclusion of facilitating conditions aligns with the study's focus on understanding factors influencing customer purchase intentions rather than actual usage, coherent with outcomes by Venkatesh *et al.* (2003). The decision to incorporate EV knowledge and advertisement into the model stemmed from a desire to gain deeper insights into strategies for enhancing consumer awareness of EV purchases. This expanded model offers a further nuanced comprehension of the factors at play in shaping consumer intentions.

Data collection utilized the convenience sample method through an online survey form. Convenience sampling is a commonly used non-probability sampling technique in exploratory and early-phase behavioral investigations, even though it may restrict generalizability. This is particularly true when target populations are hard to reach or have specialized needs (Etikan et al., 2016; Saunders et al., 2019). Since high-income people are more likely to be able to afford and adopt electric vehicles (EVs), they were specifically chosen for this study. This is consistent with research showing that early adopters of EVs are typically wealthier, more educated, and more environmentally conscious (Alyamani *et al.*, 2024; Alzoubi *et al.*, 2025; Lampo *et al.*, 2025; Rezvani et al., 2015; Wang et al., 2021). Since EV markets are still in their infancy in developing nations like Malaysia, concentrating on those nations offers useful information for shaping demand and formulating policy. While acknowledging the limitations of data generalization inherent in convenience sampling, this approach was deemed pragmatic due to constraints in cost and time (Saunders, 2014). The study garnered responses from 278 participants, a substantial sample size for the intended analysis.

Given the high cost associated with EVs, the questionnaire was strategically distributed among high-income individuals in Malaysia, categorized into three income groups: B40 (lowest 40%), M40 (moderate 40%), and T20 (top 20%). This targeted approach ensures that respondents possess a certain level of financial capability and, subsequently, better knowledge, aligning with the notion that high-income individuals are more likely to engage in sustainable actions (Chan, 2001). This deliberate sampling strategy enhances the relevance and reliability of the collected data, contributing to a more robust exploration of consumer intentions toward EVs in the Malaysian context.

3.2. Demographics

<Insert Table 1>

4. Results

4.1. Measurement Model Evaluation

PLS-SEM, or partial least squares-based structural equation modeling, was employed to do preliminary factor analysis. Cheung *et al.* (2021); Koay *et al.* (2020). The SmartPLS approach was employed because this research tested a hypothetical framework from a projection aspect.

There are three ways to examine construct reliability and validity (Hair Jr *et al.*, 2017). The factor loadings of all items were calculated first, followed by the Cronbach Alpha value, and lastly, the average variance extracted (AVE) (Henseler *et al.*, 2009). Cronbach's alpha (CA) for PE is 0.736 on average for validity and reliability assessment. CA alpha reliability for EE is 0.776. The CA value for constructing SI is 0.770. CA reliability for the advertisement scale is 0.887. The EV knowledge has a CA reliability of = 0.853. The CA value for the PI is 0.845. Because each construct's values are more than the recommended levels, there is no problem with reliability.

4.1.1 Reliability and Validity

The developed framework was examined, and items with smaller factor loadings than 0.60 were excluded (Hair *et al.*, 2011) even though the initial model had all dimension components. The AVE values surpassed the threshold of 0.50 (Hair Jr *et al.*, 2017). The reliability and validity values are reported in Tab 2, but an AVE higher than 0.40 would also be satisfactory (Fornell *et al.*, 1981). The PE construct's AVE value is 0.453, which is marginally less than the generally advised threshold of 0.50; nonetheless, new PLS-SEM research shows that this criterion can be accepted. If the composite reliability is greater than 0.70, which indicates satisfactory internal consistency reliability, then an AVE below 0.50 may be considered acceptable (Hair Jr, Hult, RingleandSarstedt, 2021). Since the CR for PE in this investigation is higher than that threshold, its preservation is justified. Furthermore, Hair Jr, Hult, Ringle, Sarstedt*, et al.* (2021); Sarstedt *et al.* (2014) highlight a more comprehensive approach to measurement validation, arguing that AVE should be understood in combination with other measures such as model fit, indicator loadings, and CR rather than alone. Given the theoretical significance of PE, high CR, and robust item loadings, the inclusion of the construct with an AVE of 0.453 is therefore still theoretically and methodologically sound. Values for rho A and CR (composite reliability) are higher than the minimum acceptable ratio of 0.7. All the CA, rho A, and CR ratios are above 0.7, indicating that the consistency objective has been met. All the results are higher than 0.4, indicating that the factor items meet the validity criteria. As an outcome, these values satisfy the criteria for validity and reliability.

<Insert Table 2>

4.1.2. Heterotrait-Monotrait Ratio (HTMT)

The HTMT methodology, thought to be the most recent method for a discriminant validity study, was used to evaluate discriminant validity (Henseler *et al.*, 2015). The appropriate HTMT was determined to be less than the identified threshold ratio of 0, by Henseler *et al.* (2015).

HTMT discriminant validity can be estimated by applying one of two methods: (1) as a criterion or (2) as a statistical assessment. In the criterion approach, the discriminant validity dilemma is indicated if the number of HTMT seems to be more significant than 0.85 (Kline, 2011) or a value of 0.90 (Gold *et al.*, 2001). The next principle is to compare the null hypothesis (H0: HTMT 1) with the alternative hypothesis

(H1: HTMT 1) and determine whether there is an issue with discriminant validity values when the confidence interval is greater than 1 (Henseler *et al.*, 2015). It seems that there exists no problem with discriminant validity because none of the listed values are higher than one. All values are less than one and stay legitimate and suitable for further analysis. There seems to be no issue with the discriminant validity in such values, as may be demonstrated in Table 3.

The values listed above demonstrate that the data is reliable and valid. Moreover, HTMT was determined to measure the discriminant validity (see Tab 3).

<Insert Table 3>

4.2. Structural Model Evaluation

The R^2 coefficient of determination ratio is 0.682, showing that 68% of the instances accurately forecast the item being predicted, and the Q^2 coefficient of variance is 0.408, demonstrating around 41% of the scenarios have prognostic relevance, as displayed in Fig. 2. Following the outstanding outcomes of the measurement model assessment (MMA), the existing study explored the hypotheses by employing the structural model assessment (SMA) displayed in Fig. 3. Employing 5000 bootstrap tests, the statistical significance level, t-test values, and magnitude impact of pathway coefficients were investigated (Jeon *et al.*, 2019).

Meanwhile, multiple regression was utilized to assess the variables "PE, EE, SI, EV knowledge and advertisement" influence on consumer intention. The outcomes illustrate that all independent factors have a substantial effect on consumer intention.

<Insert Figure 2>

The findings reveal a model with an R2 value of 0.682 and a 68.2% explanatory capability for consumer purchase intention. In addition, it found a strong and positive link between purchase intention and PE, EE, SI, PEK, and ADV. Tab. 4 is explicitly a detailed review of the variables' results and hypotheses. The path-coefficient values demonstrate whether the hypotheses are validated or not.

<Insert Table 4>

According to the findings, given that consumer knowledge of EVs is low, this current research validates the application of variables that motivate consumers and boost intentions to purchase EVs. According to earlier research by Venkatesh *et al.* (2002), UTAUT was also crucial in influencing customer behavior and the adoption of various technologies (Abbasi, Johl*, et al.*, 2021; Afshan *et al.*, 2016; Almetere *et al.*, 2020; Altalhi, 2021; Bhat *et al.*, 2021; Bozorgkhou, 2015; Howard *et al.*, 2017; Madigan *et al.*, 2016; Martins *et al.*, 2014; Pai *et al.*, 2011; Zhou *et al.*, 2010). As customer motivation and understanding regarding EV features were restricted, our study has instead suggested these aspects in a motivating framework. The availability of the UTAUT model was found to improve customer attitudes regarding EVs. Factors identified in this research were found to be important to influence the consumer.

4.3. Discussion and Hypothesis Testing

In the realm of EV adoption, this study unleashes five hypotheses linking varied factors to purchasing intention, scrutinizing their relevance through path coefficients via the bootstrapping technique (Henseler *et al.*, 2015).

The influence of PE and consumer intention has demonstrated a substantial association in this study (T = 2.816, P = 0.005); therefore, H1 is supported. Some items of the PE were eliminated because of lower values of PE factor loadings, where the construct's influence remained significant. The outcomes of this study support literature, e.g., the acceptance of innovative technologies by Alalwan (2018); Jaradat *et al.* (2013); Morosan *et al.* (2016); Oliveira *et al.* (2016). However, PE outcome in some studies was inconsequential, as in the Abbasi, Johl*, et al.* (2021); Verkijika (2018) study, where PE had no meaningful outcome on customer intention. Though, this study outcome was found effective in motivating consumers.

The influence of EE on buying intention was favorable and effective (T = 3.170, P = 0.002); the outcomes of the study corroborate H2. The findings are consistent with those of Abbasi, Johl*, et al.* (2021); Casey *et al.* (2012); Escobar-Rodríguez *et al.* (2014); Tosuntaş *et al.* (2015); Venkatesh *et al.* (2003). As customer interest in EVs grows, so will their potential to purchase these vehicles. Effort expectancy anticipated by consumers that EV use will require less work, conserve fuel, and be more ecologically benign. As a result, consumers will turn out to be skilled at enjoying it.

The impact of SI on customer intentions was discovered to be substantial and favorable (T = 3.576, P = 0.000), and the outcomes confirm H3. A positive connection was discovered between SI and PI, which is consistent with Escobar-Rodríguez *et al.* (2014); Thomas *et al.* (2013); Venkatesh *et al.* (2003); Yu (2012). Malaysia is a socialist country, which signifies that individuals value extended families and ties. In this situation, Malaysian consumer motives might be greatly influenced by those who are normally adjacent to them. Consumers' understanding of the ecosystem and automobiles that are environmentally friendly can affect the intentions of others.

Furthermore, the influence of EV knowledge on customer intention is revealed to be substantial and positive. H5 have supported outcomes (T = 5.225, P = 0.00). According to Chang and Chang (2017), EV knowledge has a big impact on consumers' innovative technology adoption.

<Insert Figure 3>

The direct impact of advertising on purchasing intention was found to be effective (T = 2.287, p=0.022), and the results support H5. Advertisements can help to increase customer awareness of a specific technology product, which can be a crucial component in increasing consumer motivation. The result of this factor supports the previous studies which represent advertisement is significant in motivating a consumer

to purchase a specific product (Abbasi, Shaari*, et al.*, 2021; Arbak *et al.*, 2019; Jan *et al.*, 2019; Petkou, 2019).

Additionally, the correlations of PE↔PI, EE↔PI, SI↔PI, ADV↔PI, and EVK↔PI got S.D. values of PE 0.051, EE 0.063, SI 0.063, ADV 0.056, and EVK 0.061, along with median values of PE 0.135, EE 0.033, SI 0.039, ADV 0.299 and EVK 0.118 respectively highlighting their deviation with positive correlation ratios creating long left-tail distribution curve (See Table 4). Finally, the correlation values of all variables trailed a standard rate of recurrence distribution over a range of affirmative values from as least as -3.812 for ADV↔PI to the highest value of 1.605 for PE↔PI.

<Insert Figure 4>

According to the results, improving consumer knowledge and insights into EV attributes can increase consumer motivation. This study backs up the practice of UTAUT in improving and inspiring consumers to buy EVs (Venkatesh *et al.*, 2003). The outcomes of the research suggest that the strategy is effective at promoting EV adoption by incentivizing users to accept vehicles. The results obtained from the current study indicate that enhancing consumer knowledge about and exposure to the characteristics of electric vehicles (EVs) could potentially influence customer motivation. This research validates the pragmatic significance of UTAUT through its ability to enhance and convince consumers to purchase electric vehicles. The outcomes of the study specify that the framework holds importance when considering EV motivation.

Although it is recognized that aspects such as environmental concern, green knowledge, and enabling conditions have been examined in connection with EV adoption, the present study adds to the body of literature by providing a novel conceptual integration: expanding the UTAUT framework with EV knowledge and advertising, two constructs that play different roles in influencing behavioral intention in a rapidly changing knowledge and technological context.

EV knowledge, as opposed to generic green knowledge or environmental concern, is domain-driven and directly pertains to consumers' cognitive comprehension of EV technology, including its detrimental effects on the environment, operational usefulness, economic viability, and technical aspects. This specific knowledge directly supports the fundamental UTAUT principles, especially effort and performance expectancy. According to earlier research, such as Rezvani et al. (2015), Wang et al. (2021), and Kapser and Abdelrahman (2020), particular knowledge of EVs is a crucial precondition for adoption intentions and differs qualitatively from more general environmental concern.

Similarly, as conceived in this study, advertising is a strategic influence procedure that alters social influence and perceived conducive conditions, rather than just being a communication channel. Not many studies have empirically investigated advertising as a structured and quantified concept within the UTAUT framework, especially in the EV domain, but previous UTAUT-based studies have generally addressed

issues like media exposure or subjective norms. Studies by Chen et al. (2023) show that ads can significantly affect customer perceptions and hasten adoption behavior in early-stage marketplaces, particularly when they are structured around sustainability, creativity, and financial incentives.

UTAUT offers a robust socio-technical framework that encompasses performance-based, effort-based, social, and infrastructure factors, in contrast to TAM and TPB, which place a more abstract emphasis on attitudinal beliefs and perceived control. This study is novel because it applies UTAUT to a relatively understudied empirical setting (high-income EV users in Malaysia) and incorporates communication (advertising) and cognitive readiness (EV knowledge) as contextual, dynamic extensions that are more easily implemented by government officials and industry stakeholders. A distinct theoretical and empirical contribution beyond the current TAM and TPB extensions is established by this synthesis of model expansion, construct accuracy, and contextual relevance.

This research makes a distinctive contribution by incorporating EV knowledge into the UTAUT framework in light of motivating factors. Previous research by Almetere *et al.* (2020); Chen *et al.* (2020); PARK *et al.* (2021); Patil *et al.* (2020); Saparudin *et al.* (2020); Wedlock *et al.* (2019) explored and expanded the UTAUT to encompass the adoption of diverse technological innovations. The UTAUT paradigm has proven to be operative in facilitating the approval and application of new-technology products in several studies. The current research, however, discerns and adds to the understanding of consumer motivation, specifically among high-income individuals. The present work aims to improve consumer understanding and knowledge of green automobiles, which is currently limited. By providing efficient approaches, this study can contribute to improving customer knowledge in light of motivating factors.

4.4. Conclusion

This study identified new avenues to EV adoption based on the study model, which includes EV knowledge and advertisement along with EE, SI, and PE, providing a contextually integrated understanding of acceptance of electric vehicles. The findings revealed that all independent variables are effective in increasing consumer motivation and indicate that consumers' propensity to adopt EVs is highly influenced by EV knowledge and advertising. The measurement of sustainable features in terms of motivation becomes increasingly significant in the current conditions. The lack of consumer understanding of EVs and the absence of persuasive advertising methods are two important gaps unique to emerging countries like Malaysia, which are addressed by this research. In contrast, many other studies use standard predictors of behavioral intention. Among these, EV advertising and information stand out as crucial levers, especially in regions where infrastructural and public awareness are still growing. The findings suggest that people are more likely to consider buying an EV when they are well-informed, both through official knowledge dissemination and effective marketing.

The study makes a unique contribution by strengthening the UTAUT framework's prediction ability in the context of EVs by incorporating cognitive (EV knowledge) and external influence (advertising) elements. In addition to giving policymakers, marketers, and other stakeholders in the automotive industry a more comprehensive grasp of consumer decision-making, this also delivers practical insights. In particular, bridging the information gap and influencing positive consumer attitudes toward EV adoption can be greatly aided by focused marketing campaigns, community awareness initiatives, and educational campaigns. All things considered, this study tackles a critical practical problem—how to boost EV adoption through persuasion and information—while also advancing theoretical modeling related to technology acceptance. For Malaysia and other developing countries looking to make the switch to cleaner transportation systems, these insights are especially essential.

4.4.1. Implications

This research intends to enhance the existing body of knowledge concerning technological acceptability in Malaysia, particularly concerning consumer motivation toward EVs. Initially, this research improves new knowledge about the environmental elements that can improve consumer motivation, where advertisement becomes a vital factor in enhancing motivation towards EV adoption. The advertisement was a new construct in the UTAUT model, where it becomes a vital element in enhancing consumer motivation for the acceptance of EVs. The concept of motivation through vehicle features can be applied to various social media platforms for advertisement strategies like Facebook, WhatsApp, YouTube, TikTok, etc., to develop consumer intentions. The present study assesses the adoption of EVs in Malaysia, specifically focusing on several factors related to EVs along with UTAUT, such as advertisement and perceived environmental knowledge, which have been ignored by the previous studies. When it comes to customer motivation to acquire EVs, studies are lacking. This study area focuses on consumer EV motivation. As far as the author realizes, this is the initial stage of developing a model for the UTAUT that incorporates PE, EE, EV environmental knowledge, SI, and ADV to optimize consumer incentives for adopting electric vehicles (EVs). This study aims to uncover the key factors that can impact consumer motivation to buy EVs by devising effective marketing strategies.

The study's findings highlighted motivational elements that have a substantial influence on consumer EV acceptance and may create an apparent benefit for manufacturers and the environment. An awareness campaign's potential impact will increase customer motivation and interest in EV adoption. This study specifically helped to increase the acceptability of EVs in the automobile environment by considering advertising. The study's findings also suggested that more aggressive advertising strategies are more likely to increase customer EV inclination. EVs already exist in Malaysia, although demand is quite low. The main

issue is customer unawareness and a lack of information regarding EVs, which can be mitigated by strong marketing techniques implemented by companies and the government to boost EV sales.

4.4.1. Contributions

Malaysia, a nation that relies heavily on energy, is under pressure from other countries to adopt sustainable technology and reduce its emissions of greenhouse gases, which is essential if it is to take the required steps to reduce harmful gases. EVs with zero carbon emissions have been introduced, and while they can aid in lowering transportation emissions, their sales are quite limited. Automakers and government organizations could increase consumer motivation and environmental awareness with the use of efficient marketing tactics. Supply and demand make it possible for the sale of EVs to increase among consumers. High capital costs are required for financing EV production, which might reduce and affect product prices to entice customers. The authorities incentivize and support local automobile manufacturers to develop innovative technological products by providing significant subsidies, hence reducing prices and enhancing consumer accessibility (Star, 2019). The current research encourages manufacturers to implement EV-motivating strategies to promote EV acceptance.

The study findings could be utilized by automakers and policymakers to enhance consumer motivation with advertising strategies to develop consumer intentions toward EVs. The extended model with advertisement could describe the continuance intention use by 61%, and all constructs significantly affect consumer intention towards EVs. Decision-makers could use the findings as an idea to grasp the motivational role of UTAUT constructs and advertisements that can increase the number of consumers of EVs in Malaysia. The extensive acceptance of EVs would substantially reduce the ratio of carbon emitted from transportation and participate in achieving the UN's SDGs by 2050 and the GreenTech Master Plan by 2030. Acceptance of EVs aids in the decline of transportation emissions and the achievement of the Climate Change goal. Companies could promote and publicize EVs to encourage users to increase their eco-friendly purchasing behavior, thus contributing to the SDGs and the Twelfth Malaysia Plan, 2021-2025, of lowering transportation emissions. This study suggests that motivators will be successful in increasing customer adoption intention toward EVs.

By suggesting an investigation framework that incorporates multiple UTAUT prospects, this study intends to forecast Malaysian consumer knowledge as well as interest. The purchase of EVs is modest, which includes moral and philanthropic considerations. It can be further defined successfully with the aid of UTAUT and motivating elements. This UTAUT hypothesis explained a lot more variance with new technology (Maillet *et al.*, 2015).

4.4.2. Managerial Implications

The implications of an inclusive perspective on motivating factors for customer behavior are extensive. The research findings can be utilized by authorities and policy-makers to enhance consumer awareness as well

as understanding regarding eco-friendly electric vehicles. Environmental awareness-raising education strategies should be implemented by auto manufacturers and government regulators to encourage consumers to purchase sustainable vehicles. To boost consumer motivation, manufacturers may, for instance, develop social marketing strategies emphasizing ecological prospects and electric vehicle (EV) features that have been derived as a significant factor. In their promotion strategy, these manufacturers should provide synchronized and correct information on automobiles. Meanwhile, consumers desire eco-friendly items, and ecological knowledge awareness will help the firm attract prospective customers. Environmental awareness activities should be implemented to encourage consumers' interest in EVs. Furthermore, to inspire consumers toward sustainable automobiles, promotional techniques for awareness must be up-to-date. Any unethical and societally destructive practice can have a detrimental impact on consumers' perceptions regarding these products. While devising advertisement policies by using motivational factors, companies should keep the socially harmful perspective in mind.

Findings from this study indicate that consumers have a strong preference for eco-friendly products. But their perspective on EVs is rather restricted, so it's necessary to raise awareness to encourage consumers to buy them. It is possible to influence consumers' buying intentions using incentives to improve the sales of electric vehicles, as demonstrated in Fig. 5.

<Insert Figure 5>

4.5. Limitations and Future Research

This study admits various limits, which may motivate potential studies to consider. In this research, UTAUT factors PE, EE, and SI are used. Although these constructs are particularly essential in predicting consumer intentions toward new technology adoption (Al-Shafi *et al.*, 2010). Future studies can consider all UTAUT characteristics by adding additional aspects to analyze customer purchasing intention toward EVs.

Future research could be conducted to incorporate these studies into larger datasets to obtain better results, as this study data was confined to 299 participants and cannot be considered to be generalized in the entire context, and structural equation modeling was ruled out. There is still potential for more research using a mixed-method technique to examine the important aspects that drive consumer enthusiasm to buy EVs. In the future, the EV emotional aspect in overwhelming hurdles may be investigated. The conclusion is that consumers limited motivation and EV knowledge prevent them from accepting these vehicles, and this should be expanded across the country (Malaysia).

Data availability

The authors do not have permission to share data.

Appendix

Questionnaire Items

Performance Expectancy
The use of EVs will enable me to have eco-friendly behavior.
I can learn the EVs usage as a new technology more efficiently
The use of EVs can reduce my fuel and maintenance costs as compared to gasoline vehicles
Home charging availability of EVs is helpful to motivate me.
I think Using the electric vehicles will have no drawbacks
I am influenced that the use of EVs will improve my learning and technical activities
I believe Using EVs will enable me to follow the global trend of reducing transport carbon emissions.
I believe the Usage of EVs will be helpful in reducing environmental degradation
Effort Expectancy
I believe the use of EVs will be characterized without any stress.
I hope the use of EVs will not require any technical expertise to handle
I believe the use of EVs can reduce my fuel and maintenance costs as compared to gasoline vehicles
I think the use of EVs as a sustainable vehicle enhances the consumer satisfaction of being environmentally conscious
I believe barriers in EV usage like limited battery timings, cost of vehicles and charge infrastructure make it difficult to buy
I think sustainable EV adoption will not be frustrating
Electric Vehicle Knowledge
I know different types of EVs available in the Malaysian market
I believe EV knowledge is the best source to enhance consumer motivation
I know EV features over traditional vehicles to reduce transport emissions
I am familiar with EV performance (like charging times, driving comfort, acceleration and range, etc.)
Advertisement
Advertisements enhance and motivate me to buy any product
Advertisement changes my behavior positively
Advertising improves product sales effectively
The more frequently I view an advertisement, the more likely I buy the product.
Purchase Intention
I intent to buy sustainable products because they are environment friendly.
I will help the environment by purchasing sustainable products and electric vehicle
I would suggest others to buy and use sustainable products to save the environment
I intend to purchase the electric vehicle although it is expensive
I am very likely to purchase electric vehicles in the future
Social Influence
I believe my family, peers, and friends know about sustainable products and environmental degradation
I think If my friends buy sustainable products i.e., EVs, then they will also insist me buy these products
I will share information about sustainable products with my friends and family members.
I believe my family and friends prefer to buy sustainable products

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Tables

Table 1. Demographic Profile of Respondents (n=278)

Demographic	Frequency Rate	Percentage
Male	180	64.7%
Female	98	35.3%
Age Group		
18-29	12	4.3%
30-39	82	29.5%
40-49	132	47.5%
50-59	44	15.8%
60 years and over	8	2.9%
Race		
Malay	134	48.2%
Indian	77	27.7%
Chinese	46	16.5%
Others	21	7.6%
Income (RM)		
10001 - 15000	152	54.7%
15001 - 20000	61	21.9%
20001 - 25000	51	18.3%
25001 above	14	5%

Source: Authors Estimations

Table 2 Measurement model assessment.

|	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
ADV	0.887	0.896	0.922	0.746
EE	0.776	0.783	0.848	0.528
PE	0.736	0.737	0.824	0.485
EVK	0.853	0.855	0.895	0.631
PI	0.845	0.846	0.889	0.617
SI	0.770	0.801	0.851	0.591

Table 3 Discriminant Validity

	ADV	EE	PE	EVK	PI	SI
ADV						
EE	0.502					
PE	0.448	0.940				
PEK	0.361	0.612	0.690			
PI	0.549	0.821	0.830	0.801		
SI	0.515	0.706	0.742	0.650	0.806	

Table 4. Structural Model Assessment.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ADV -> PI	0.127	0.123	0.056	2.287	**0.022**
EE -> PI	0.204	0.203	0.064	3.170	**0.002**
PE -> PI	0.151	0.153	0.054	2.816	**0.005**
EVK -> PI	0.335	0.333	0.064	5.225	**0.000**
SI -> PI	0.229	0.234	0.064	3.576	**0.000**

Figures
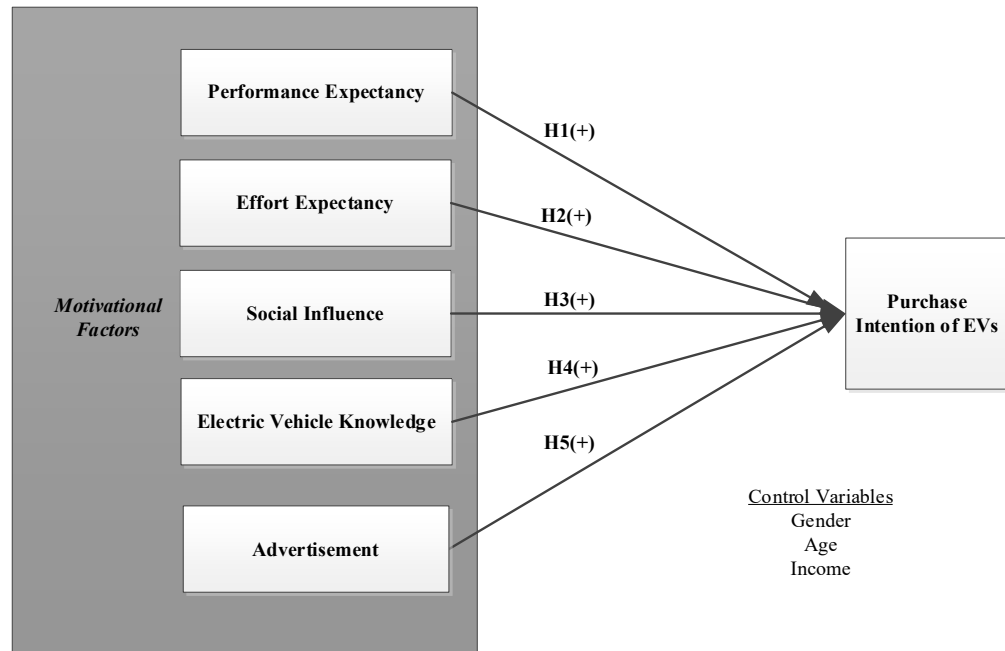
Figure 1. *Model Adopted from Venkatesh et al, 2003*
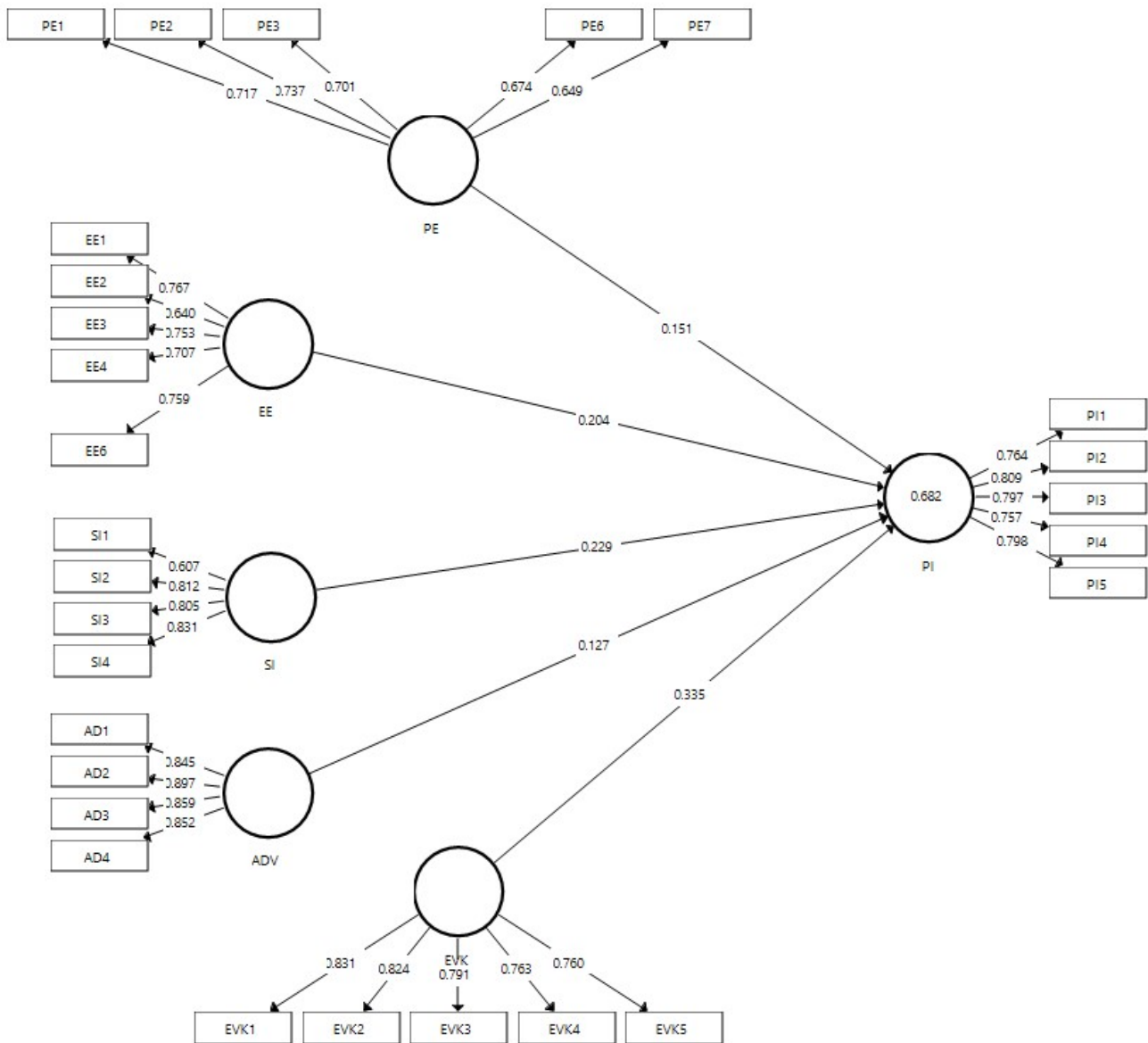
Figure 2. Structural model.
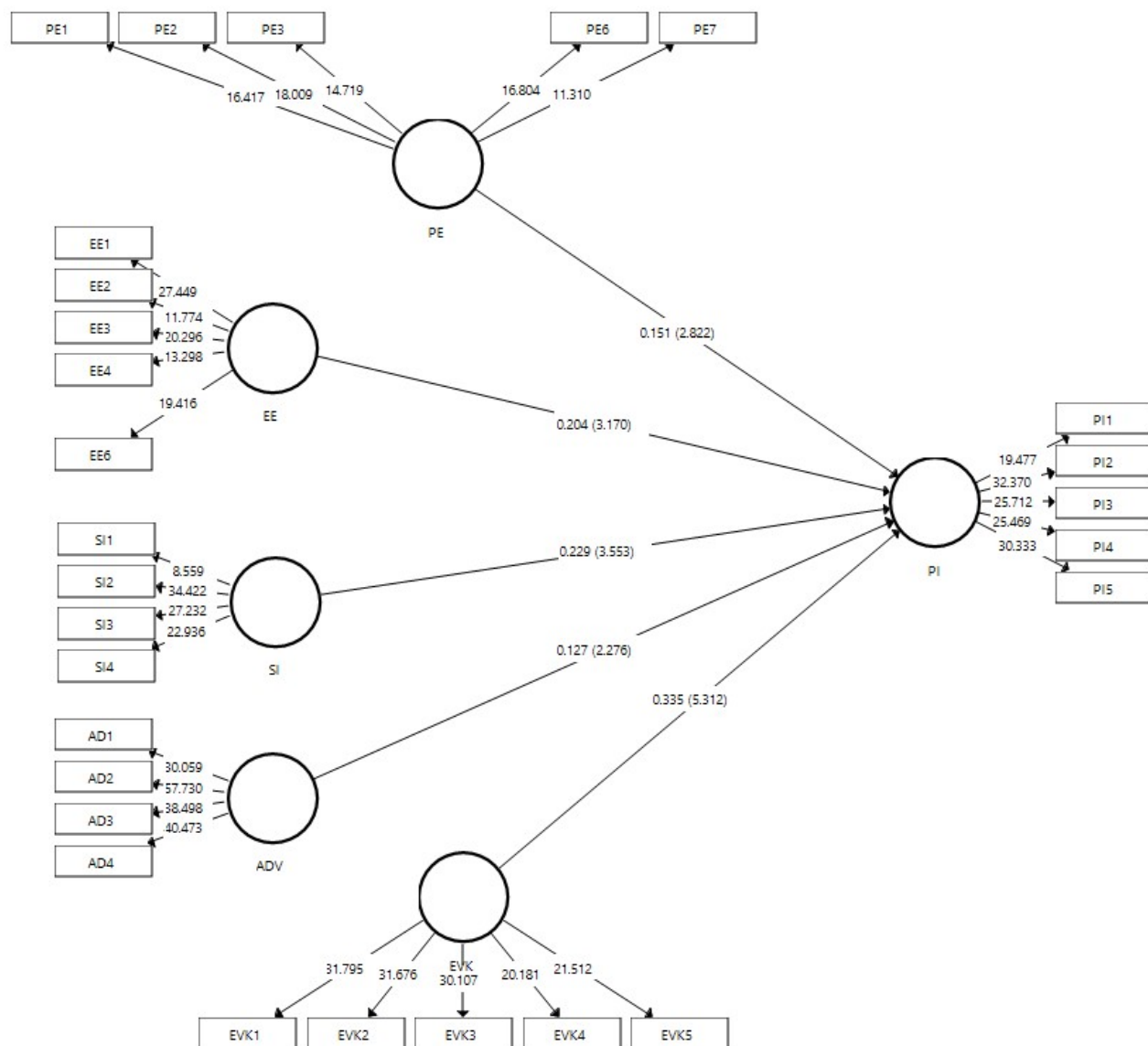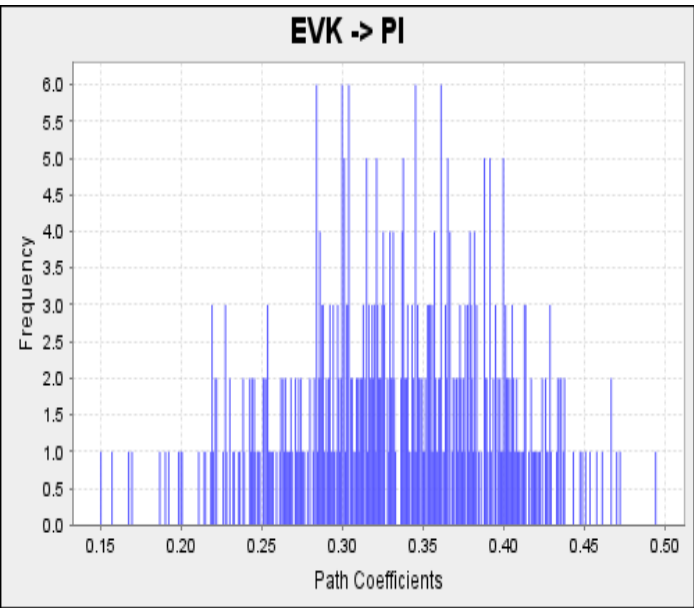
Figure 3 Measurement Model

PE -> PI

EE -> PI

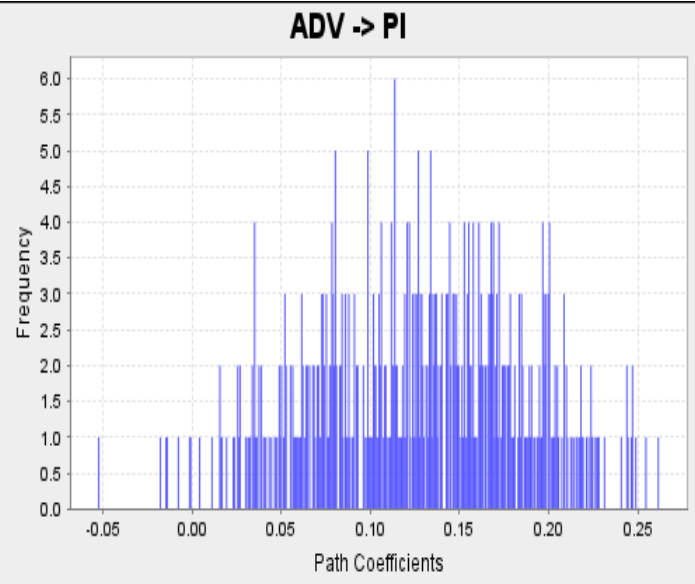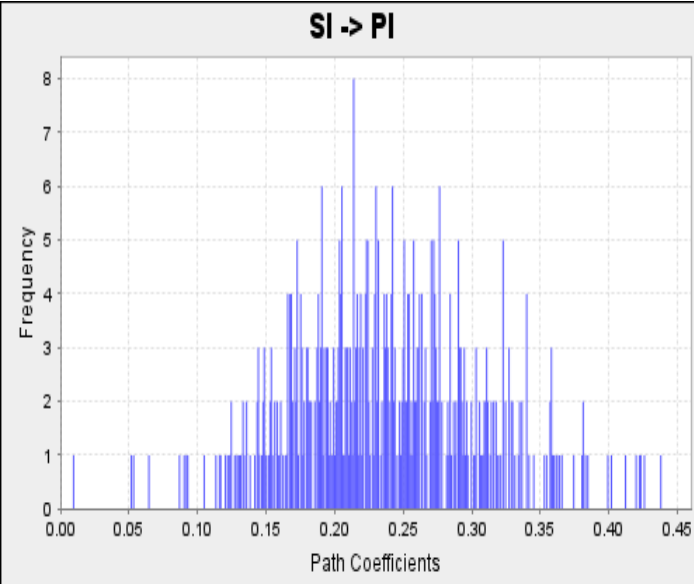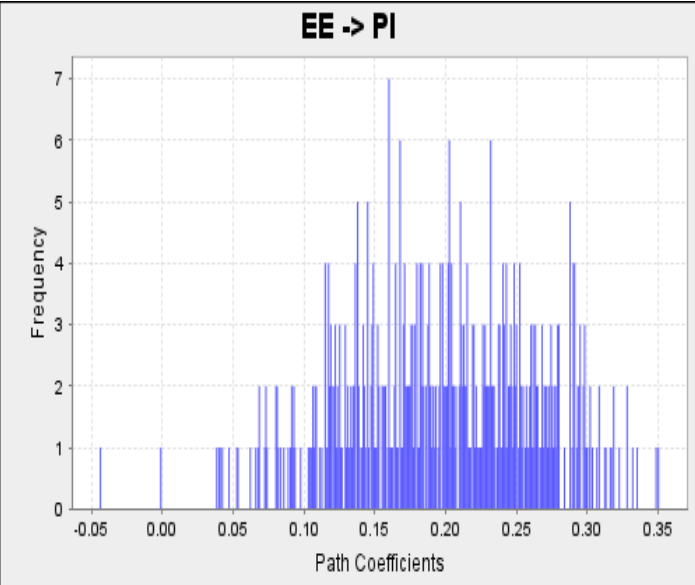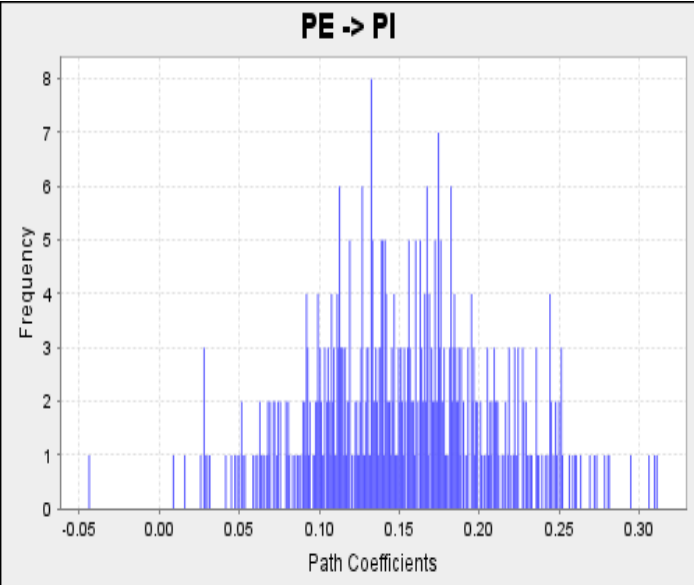**SI -> PI**

ADV -> PI

EVK -> PI

Figure Histogram 4

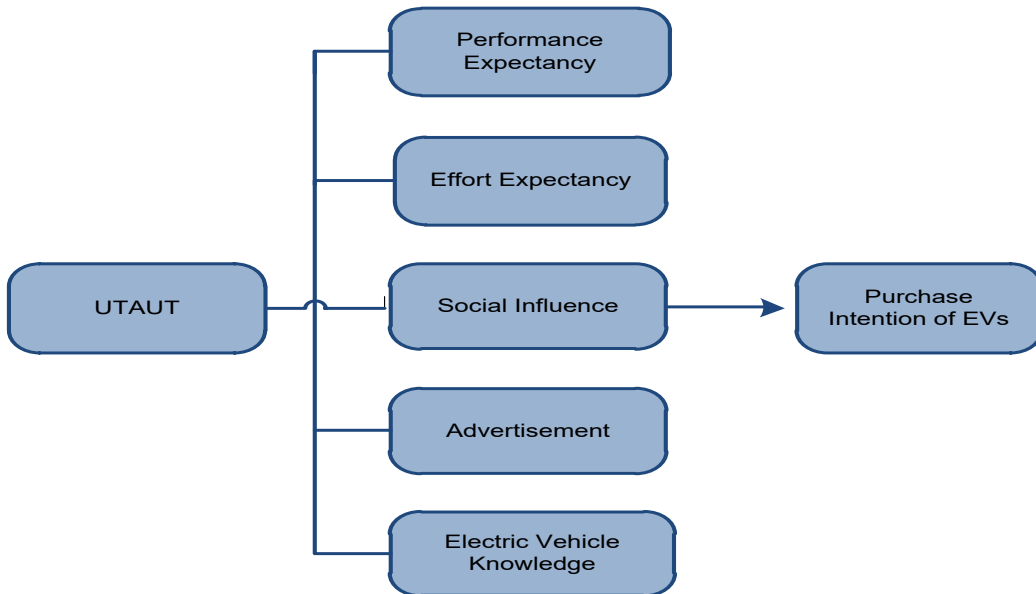*(a)Histogram of Correlations (PE-PI). (b) Histogram of Correlations (EE-PI) (c) Histogram of Correlations (SI-BI). (d) Histogram of Correlations (ADV-PI) (e) Histogram of Correlations (EVK-PI)*

Figure 5 Conceptual Model